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(71) Applicant: INTELLIGENT VEHICLE SYSTEMS, INC. [US/US]; 2005 Sunset Hill, Rowlett, TX 75088 (US).

(72) Inventors: ADCOX, Thomas, A.; 17687 County Road 537, Nevada, TX 75173 (US). ADCOX, William, R.; 10100 Bryant Road, Lexington, OK 73051 (US). VAN-DER DRIFT, Eric, N.; 2005 Sunset Hill, Rowlett, TX 75088 (US).

(74) Agent: SMITH, Steven, W.; Smith & Danamraj & Youst, P.C., Suite 1200, LB-15, 12900 Preston Road, Dallas, TX 75230 (US).

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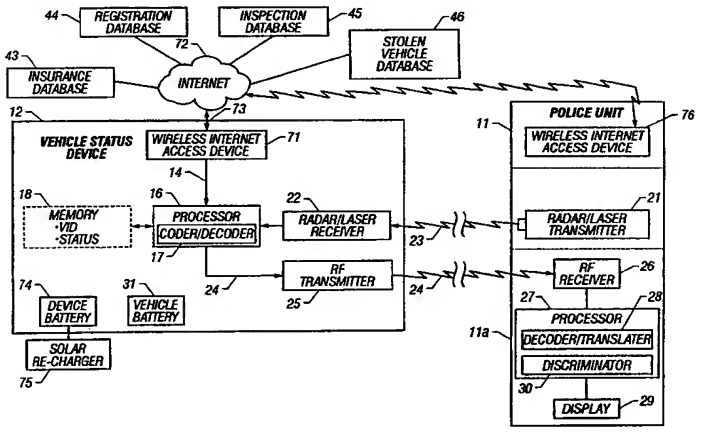
(54) Title: VEHICLE IDENTIFICATION AND STATUS COMMUNICATION DEVICE AND SYSTEM



(57) Abstract: A vehicle status device (12) and system (10) for remotely updating and locally indicating the status of a vehicle. The vehicle status device indicates status information for the vehicle on a vehicle-status indicator (65) on the vehicle when the device is interrogated by an interrogating unit (11). The device includes a database (18) of status information for the vehicle and owner. An update receiver (15) in the device receives encoded updated information from a wide area paging network or through a wireless Internet access device (71) for storage in the database. An interrogation receiver (22) receives an interrogation signal (23) from the interrogating unit, and a processor (16) decodes the status information and sends it to the status indicator in response. Alternatively, the status information may be transmitted to the interrogating unit. The interrogating unit may include a police radar or laser transmitter (21) for transmitting the interrogation signal to the vehicle status device.

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vehicle identifcation and status commumication device and system

TECHNICAL FIELD

This invention relates generally to vehicle identification and location devices and, more particularly, to a vehicle-status device and system for remotely updating and locally indicating the status of a vehicle.

BACKGROUND ART

There are millions of cars and trucks operating on the road today. Local, state, and national governments attempt to control the licensing and operation of these vehicles in order to promote public safety and obtain revenue. In addition to the well known requirements for obtaining a driver's license, state governments typically require that an annual registration fee be paid for each vehicle in order to maintain a current license for the vehicle. In addition, most states require that a safety inspection be performed on the vehicle each year by a state-approved inspection station. Many states have also passed laws requiring that drivers maintain a minimum level of liability insurance for each vehicle that they operate. In an effort to enforce these laws, drivers may be required to present proof of insurance for their vehicle at the time that they obtain a safety inspection or renew their registration.

There are still major problems in many states with drivers who do not comply with the above requirements. These drivers may forge vehicle registration stickers, safety inspection stickers, or proof-of-insurance papers. Alternatively, they may purchase insurance long enough to receive proof-of-insurance papers, and then cancel it shortly thereafter. These actions negatively impact public safety and increase the cost of insurance for all of the legitimate vehicle operators in the state.

Law enforcement personnel have an additional problem in identifying stolen vehicles. Some vehicles may be equipped with security systems which broadcast a location for the vehicle if the vehicle is started and/or driven without performing certain security functions. These security systems can assist the police in locating the stolen vehicle. Most vehicles, however, do not have such security systems, and even for ones that do, actual identification of the vehicle is still difficult. The police must visually read the license number and verify this number in their database.

In order to overcome the disadvantage of existing solutions, it would be advantageous to have a vehicle-status device and system for remotely updating and locally indicating the status of a vehicle. Such a device would include an electronic vehicle-status indicator for use by law enforcement personnel to quickly and easily determine the status of any vehicle. The present invention provides such a device and system.

DISCLOSURE OF THE INVENTION

In one aspect, the present invention is a vehicle status device for displaying status information for a vehicle. The device includes a database of status information for the vehicle; an update receiver that receives updated vehicle information for storage in the database; an interrogation receiver that receives an interrogation signal from an interrogating unit; a vehicle status indicator for indicating the vehicle status information; and a processor that retrieves the vehicle status information from the database and sends the information to the indicator in response to the interrogation receiver receiving the interrogation signal. The vehicle status indicator may include a plurality of summary status indicators that provide a summary of the vehicle status in predetermined areas of interest at a

glance, and a display that provides detailed vehicle status information.

In another aspect, the present invention is a vehicle status device for indicating status information for a vehicle and an owner of the vehicle. The device includes a database of status information for the vehicle and the owner, a wide area pager receiver that receives encoded updated vehicle and owner information from a wide area paging network, an interrogation receiver that receives an interrogation signal from the interrogating unit, and a vehicle status indicator for locally indicating vehicle and owner information. The device also includes a processor having a coder/decoder that decodes the updated information received from the wide area paging network and sends the decoded information to the database. In response to the interrogation receiver receiving the interrogation signal, the processor retrieves the information from the database and sends it to the status indicator.

In yet another aspect, the present invention is a system for remotely updating and locally displaying the status of a vehicle. The system includes a vehicle status device for locally displaying status information for the vehicle when an interrogation signal is received. The status device includes a database of status information for the vehicle; an update receiver that receives updated vehicle information for storage in the database; an interrogation receiver that receives the interrogation signal from an interrogating unit; and a vehicle status indicator for indicating the vehicle status information in response to the interrogation receiver receiving the interrogation signal. The system also includes an interrogating unit comprising an interrogation transmitter for transmitting the interrogation signal to the vehicle status device.

In yet another aspect, the present invention is an electronic vehicle status device for displaying status

information for a vehicle. The device includes a wireless Internet access device that requests and receives updated vehicle information from at least one external database that is accessible through the Internet. The device also includes a vehicle status indicator for indicating the vehicle status information, and a processor that receives the vehicle status information from the wireless Internet access device and sends the information to the indicator.

In still yet another aspect, the present invention is a transponder for use in a vehicle having an assigned Internet Protocol (IP) address. The transponder comprises an interrogation receiver that receives an interrogation signal from an interrogating unit, and a response transmitter that transmits the assigned IP address to the interrogating unit. The transponder may be utilized in a system for remotely monitoring the status of the vehicle. In addition to the vehicle transponder, the system includes an interrogating unit that comprises an interrogation transmitter that transmits the interrogation signal to the vehicle transponder, a response receiver that receives the assigned IP address from the vehicle, and a wireless Internet access device that requests and receives updated vehicle status information from at least one external database that is accessible through the Internet.

The vehicle may also include a wireless Internet access device and an internal database for storing vehicle status information. In this case, the interrogating unit may utilize the IP address of the vehicle to retrieve the status information from the internal database in the vehicle, and download the information over the Internet.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be better understood and its numerous objects and advantages will become more apparent to those

skilled in the art by reference to the following drawings, in conjunction with the accompanying specification, in which:

FIG. 1 is a simplified block diagram of a vehicle status device and police unit in a first embodiment of the system of the present invention;

FIG. 2 is a side elevational view of the vehicle status device mounted on a vehicle battery cable;

FIG. 3 is a cross sectional view of the vehicle status device taken along line 3-3 of FIG. 2;

FIG. 4 is a functional block diagram of the system of the present invention in which a data network monitors, processes, and updates vehicle status;

FIG. 5 is a simplified block diagram of a nationwide ticket-less toll system utilizing the vehicle status device and system of the present invention;

FIG. 6 is a simplified block diagram of a vehicle status device and police unit in a second embodiment of the system of the present invention;

FIG. 7 is an exemplary vehicle-status indicator for use with the system of FIG. 6;

FIG. 8 is a simplified block diagram of a vehicle status device and police unit in a third embodiment of the system of the present invention;

FIG. 9 is a simplified block diagram of a variation of the third embodiment of FIG. 8; and

FIG. 10 is a simplified block diagram of a vehicle status device and police unit in a fourth embodiment of the system of the present invention.

MODES FOR CARRYING OUT THE INVENTION

The present invention is essentially a remotely updatable vehicle transponder and system. Vehicle and operator status information is downloaded to the vehicle through a wide area paging network. In a first embodiment, when a police unit directs a radar/laser gun toward the

vehicle, the system responds by transmitting encoded status information back to the police unit. The vehicle status information is decoded by the police unit and displayed in plain language for the police officer to easily discern the status of the vehicle. In a second embodiment, when a police unit directs a radar/laser gun toward the vehicle, the system responds by displaying the status of the vehicle on an electronic vehicle-status indicator located on the vehicle.

FIG. 1 is a simplified block diagram of the first embodiment of the system of the present invention. The system 10 includes a police unit 11 and a vehicle status device 12. The system may also include a wide area paging network 13 which may be a satellite-based network or a ground-based network such as a cellular network. Updates to the status of the vehicle and/or the operator are communicated from state and local agencies, insurance companies, inspection stations, and/or law enforcement agencies to the wide area paging network. For example, the updates may include, but are not limited to:

- A renewed or expired registration;
- A passed, failed, or out of date safety inspection;
- Inadequate or no liability insurance;
- The identity of the registered owner;
- Whether there are any warrants for the owner;
- Expiration, revocation, or modification of the owner's driver's license, including any newly added restrictions;
- Owner status that is required by law to be reported to local authorities such as convicted sex offender status or convicted felon; and
- Whether the vehicle has been reported as stolen.

The paging network encodes the updated status information and uses the VID of the vehicle to transmit a paging signal with the encoded status information 14 to the vehicle. The information is received in a wide area pager

receiver 15. The wide area pager receiver may be a standard wide area pager receiver which passes the encoded status information to a processor 16. The system may optionally be equipped with a page response device (not shown) which transmits a page response to the wide area paging network to confirm that the updated status information was received. The processor includes a coder/decoder 17 which extracts the updated status information from the paging signal. The status information is then stored in a memory device 18 along with the vehicle identification (VID).

The police unit 11 includes a radar/laser transmitter 21 which may be a standard police radar or laser gun normally utilized to determine the speed of a vehicle. The transmitter may operate in standard police bands such as X, K, Ka as well as laser frequencies such as a 904 nanometer laser. When the radar/laser transmitter is directed toward the vehicle status device 12, a radar/laser receiver 22 in the vehicle detects the transmitted signal 23 which acts as an interrogation trigger. The receiver 22 notifies the processor 16 that a trigger has been received. In response, the processor pulls the current status information from memory 18 and uses the coder/decoder 17 to encode the information. The encoded current status information 24 is sent to a radio frequency (RF) transmitter 25 in the vehicle from which it is transmitted back to the police unit. The vehicle status device 12 may require external antennas (not shown) for the radar/laser receiver 22 and the RF transmitter 25 if the device is mounted under the vehicle hood or in some other location where the device is shielded. Omni-directional antennas may be utilized since the direction of the police unit is not known.

The encoded current status information is received by an RF receiver 26 in the police unit. The signal is then sent to a processor 27 where a decoder/translator 28 decodes the status information and uses, for example, a look-up table

to provide a plain-language translation of the decoded current status information. The plain-language translation of the current status information is then displayed on a display screen 29 for the police officer to view.

It is possible for several vehicles in close proximity to detect the interrogation trigger from the police unit and transmit a response. Therefore, the processor may also include a discriminator 30 that discriminates between multiple responses and prioritizes the responses. The discriminator may, for example, prioritize the responses so that the most serious infractions or dangerous situations are displayed first to the police officer. For example, a vehicle response indicating that the vehicle has been stolen may be displayed before the response of another vehicle indicating that the safety inspection is overdue.

Although the police unit 11 is depicted in FIG. 1 as a single unit, in practice the components of the police unit may comprise a police radar/laser gun 21 which is separate from a receiving and display unit 11a. This potential separation is indicated by the dashed line in FIG. 1. The radar/laser gun may be located in the same police car as the receiving and display unit, or it may be remotely located since no direct connection is required between the radar/laser gun and the receiving and display unit.

In the preferred embodiment, the vehicle status device 12 is powered from the vehicle battery 31. The vehicle status device may be mounted in any suitable container, and may be mounted in any suitable location in the vehicle. For example, the device may be mounted under the hood in an auto-accessory package similar to a fuse box. Alternatively, as shown in the side elevational view of FIG. 2, the vehicle status device may be contained in a cylindrical casing 32 which mounts onto a battery cable 33 from the vehicle battery. The battery cable includes an insulation layer 34 and a conductor 35. Power may be introduced by piercing the

battery cable insulation or connecting to the cable connector, and connecting the casing to an external ground 36. In another embodiment, both ends of the casing are sealed to the battery cable in such a manner that any attempt to remove the device results in disabling the vehicle. Antennas and laser targets may be mounted externally in other locations on the vehicle while the electronics are mounted under the hood.

An internal rechargeable backup battery 37 (FIG. 1) is utilized in the vehicle status device 12 to ensure that data is not lost if and while the car battery is disconnected. The backup battery senses power removal and notifies the processor 16. The processor may set the system to a standby mode to conserve battery power, and/or may set a special code to indicate in future interrogation responses that power was lost at some point.

FIG. 3 is a cross sectional view of the vehicle status device 12 taken along line 3-3 of FIG. 2. The cylindrical casing 32 surrounds the battery cable 33 from the vehicle battery. A plurality of circuit boards 38 are mounted within the casing and surrounding the battery cable. An electrode 39 pierces the insulation layer 34 of the battery cable and makes contact with the conductor 35.

FIG. 4 is a functional block diagram of a data network in which vehicle status is monitored, processed, and updated in accordance with the teachings of the present invention. The network is controlled by a network processor 41 which maintains a central database 42 comprising vehicle status records. The database is populated with vehicle status information and owner information obtained from a plurality of sources. Insurance offices 43 provide information regarding the current status of any automobile insurance policies covering each vehicle in the database. Tax offices 44 provide information regarding the payment of vehicle registration fees and property taxes. Inspection stations

45 provide information regarding state safety inspections on each vehicle in the database. Police departments 46 provide information regarding whether or not the vehicle is stolen, and information about the owner such as any outstanding warrants, felony convictions, etc. Government offices 47 provide information regarding the ownership of the vehicle and other information. Additionally, in one embodiment of the present invention, police departments may help provide emergency messaging services. When someone needs to get an emergency message to a driver, they contact the police department which then updates the database with an indication that the driver has an emergency message. The vehicle status device 12 is then updated, and whenever any police officer radars the driver's vehicle, the police unit receives an indication that the driver has an emergency message. The police can then inform the driver, for example, to phone home.

The various information sources may automatically send data to the central database 42 whenever the data changes, they may periodically update the database, or the central database may periodically query the various information sources in order to keep the data current. Likewise, a system operator 48 may direct that certain data be updated. This may occur, for example, when a police officer obtains a questionable response from a vehicle and asks the system operator for clarification.

Under the control of the network processor 41, data from the central database is sent to a transmitting facility 49 which is part of a wide area paging network. As noted in the description of FIG. 1, the wide area paging network may be a satellite-based network or a ground-based network such as a cellular network. Using the unique ID of each vehicle, the data is transmitted to each vehicle status device 12. Thereafter, when the vehicle status device detects a radar or laser interrogation 23, a response 24 including the status

information is transmitted by the vehicle status device's RF transmitter. This information is then decoded and displayed for the police officer.

In addition to the basic function of providing the police with information regarding vehicle registrations, safety inspections, automobile insurance, auto theft, warrants for the owner, and drivers license restrictions for the owner, the present invention may be utilized to perform other useful functions. Emergency messaging has already been described. Additionally, the vehicle status device 12 may provide the response necessary for access to a gated community or other restricted area. Also, businesses in high crime areas, or businesses that are particularly susceptible to crimes in which a vehicle may be involved (such as banks or convenience stores, etc.), may utilize an embodiment of the present invention in which all vehicles visiting the business are routinely interrogated for status information. This information is then recorded, and if a crime is committed, the status information becomes valuable information in the crime investigation.

Additionally, the vehicle status devices in vehicles that carry hazardous materials can be updated with information related to whether a vehicle is currently carrying hazardous material and the nature of the material being carried.

The present invention may also be utilized to implement a nationwide ticket-less toll system 50, as illustrated in FIG. 5. Participating vehicle owners can subscribe to the ticket-less toll system by providing confidential credit card information and agreeing to pay all toll charges accrued in the system. The toll system operator may conduct preliminary credit checks at this time. All toll booths such as toll booth 51 are then equipped with a radar/laser transmitter 52 which sends an interrogation signal 53 to each approaching vehicle. The interrogation signal triggers an RF response

54 from the vehicle status device 12 in each approaching vehicle. The RF response contains an identification tag which may be, for example the VID for the vehicle, which can then be matched to an identity of the owner.

The RF response is received by an RF receiver 55 in the toll booth, and is decoded by decoder 56 in a processor 57. The processor compares the VID from the response to a database of subscribers 58. The subscriber database may be located locally at the toll booth or may be remotely located and accessed over a data network 59. The database matches the VID with the subscriber's name, address, credit card information, and an indication of whether the subscriber is currently a valid subscriber. If the VID is for a valid subscriber, the toll booth approves the passage of the vehicle and an indicator 61 (such as a green light) provides the driver with approval to pass through the toll booth without having to stop. An operator display 62 may also provide the toll booth operator with an indication that the vehicle is approved for passage. The ticket-less toll system then charges the owner's credit card for the toll. Credit card transactions may be conducted in non-real time through a credit card authorization network 63. Vehicles that do not respond to the radar/laser interrogation must stop and manually pay the toll.

Since many toll plazas have more than one toll booth, there is a requirement to identify which lane the approaching vehicle is in so that the indication to proceed is provided to the correct vehicle. Adjustments may be made to the sensitivity of the radar/laser receiver 22 and/or to the transmitter power or antenna gain of the radar/laser transmitter 52 so that a response is not triggered from the approaching vehicle until the vehicle is in a particular lane and in close proximity to the toll booth.

The present invention may also be utilized by new car dealers for inventory control. With a laser/radar

transmitter and an RF receiver unit similar to the police unit 11 of FIG. 1, the dealer can quickly survey all of the cars on his lot for VIDs and other status information that may be factory programmed into the vehicle status devices 12.

FIG. 6 is a simplified block diagram of a vehicle status device and police unit in a second embodiment of the system of the present invention. In this embodiment, only the radar/laser gun 21 is required in the police unit 64. The vehicle status device 12 includes a vehicle-status indicator 65 which replaces the RF transmitter 25 in the first embodiment. When the radar/laser gun is directed toward the vehicle, the system responds by displaying the status of the vehicle on an electronic vehicle-status indicator 65 located on the vehicle. The indicator is preferably located in an area that is easily visible to a police officer approaching the vehicle. The indicator may utilize a display such as a liquid crystal display (LCD) to provide detailed status information, or it may utilize simple status indicators such as green, yellow and red status panels or lights to indicate a summary status of the vehicle in several areas of interest. The status indicators and the LCD may also be combined, with the status indicators providing a quick summary of the status, and the LCD providing more detailed information when requested.

FIG. 7 is an exemplary vehicle-status indicator 65 for use with the system of FIG. 6. This version of the status indicator utilizes simple green, yellow and red status lights to indicate the summary status of the vehicle in several areas of interest. With a green light for each area of interest indicating a good status, a police officer approaching the vehicle can tell at a glance whether a vehicle is "all green", or whether there is a potential problem. An LCD 66 is also provided for displaying more detailed status information.

A first set of indicator lights 67 may show the status of the insurance on the vehicle. If insurance is currently in force at levels that comply with the state law, a green light may be illuminated. If an insurance policy is in force, but some of its provisions do not comply with the state law, a yellow light may be illuminated. If the vehicle is uninsured, a red light may be illuminated.

A second set of indicator lights 68 may show the status of the vehicle registration. If the vehicle is properly registered, a green light may be illuminated. If the vehicle is properly registered, but is within a predetermined period of time of the expiration of the registration, a yellow light may be illuminated. If the vehicle's registration has expired, a red light may be illuminated.

A third set of indicator lights 69 may show the status of the vehicle safety inspection. If the vehicle has passed a state safety inspection, and the inspection is current, a green light may be illuminated. If the vehicle failed a safety inspection, but is operating during a grace period that the state allows for the correction of discrepancies and re-inspection, a yellow light may be illuminated. If the vehicle's safety inspection has expired, a red light may be illuminated.

For each of the above sets of indicator lights, the yellow light may alternatively be used to indicate that the associated information has not been received, or that a scheduled periodic update was missed.

A fourth set of indicator lights 70 may show whether the vehicle has been reported as stolen. If the vehicle has not been reported as stolen, a green light may be illuminated. If the vehicle has been reported as stolen, a red light may be illuminated.

Thus, the electronic vehicle-status indicator 65 essentially replaces the paper versions of the proof-of-insurance, vehicle registration sticker, and safety

inspection sticker with an electronic version that is much more reliable. This can save states millions of dollars per year in costs associated with printing, handling and mailing new vehicle stickers. In addition, the status information is more timely since the system is still updated remotely by wide area broadcast. The information is also much more difficult for dishonest drivers to falsify since the information is encoded when it is transmitted to the vehicle. State agencies may periodically change the encoding key and transmit the new key to installed vehicle status devices. New information can then be transmitted, or the vehicle's existing information can be retransmitted, so that any information that has been illegally altered is rewritten with the correct information. The indicator also instantly provides police with the important information that a vehicle has been reported as stolen.

FIG. 8 is a simplified block diagram of a vehicle status device and police unit in a third embodiment of the system of the present invention. In this embodiment, the internal database 18 in the vehicle status device 12 is optional, and may be eliminated. In addition, the wide area pager receiver 15 (FIGS. 1 and 6) is replaced with a wireless Internet access device 71 which connects the vehicle status device to the Internet 72. When the vehicle status device is interrogated by the police unit 11, the device sends status requests 73 through the Internet to access the various databases 43-46 which contain the required vehicle status information. This information is then downloaded to the vehicle status device through the wireless Internet access device 71. The processor 16 then passes the downloaded information optionally to the database 15, or directly to the RF transmitter 25 for transmission to the police unit. In this embodiment, the vehicle status device 12 may operate off of the vehicle battery 31 or a device battery 74 that is dedicated to the status device. The device battery may be

a rechargeable battery that is kept charged by a solar-powered re-charger 75.

In a variation of this embodiment shown in FIG. 9, when the vehicle status device 12 is interrogated by the police unit 11, the device uses the RF transmitter 25 to transmit an Internet Protocol (IP) address such as a Domain Name Server (DNS) address to the police unit. The police unit includes a wireless Internet access device 76 that enables the police unit to access the vehicle status device via the Internet 72 and retrieve the status information from the internal database 18. The information may then be passed back to the police unit via the Internet 72. Alternatively, the police unit may utilize the DNS address (and a police access code) to access the Internet and download the vehicle status information directly from the external databases 43-46. In this case, the status device merely acts as a transponder by transmitting the DNS address to the police unit in response to receiving the interrogation signal.

FIG. 10 is a simplified block diagram of a vehicle status device and police unit in a fourth embodiment of the system of the present invention. In this embodiment, the internal database 18 is eliminated, and the wide area pager receiver 15 is replaced with the wireless Internet access device 71 which connects the vehicle status device to the Internet 72. The device is always on, and is powered by the vehicle battery 31 or the device battery 74. The device battery may be a rechargeable battery that is kept charged by the solar-powered re-charger 75.

In this configuration, the status indicator 65 shows the last vehicle status that was downloaded from the external databases 43-46 through the Internet 72 and the wireless Internet access device. The processor 16 may be programmed to periodically update this information by sending periodic update requests 73 to the Internet. In this way, both the vehicle owner and the police may visually determine the

vehicle status. As an additional feature, a status alarm 77 may be controlled to provide a warning to the vehicle owner if one of the status areas goes "yellow" or "red". The owner can then take corrective action.

The vehicle status may also be updated on demand. When the vehicle status device 12 is interrogated by the police unit 11, the device updates its currently displayed status by sending a status requests 73 through the Internet to access the various databases 43-46 which contain the required vehicle status information. This information is then downloaded to the vehicle status device through the wireless Internet access device 71. The processor 16 then passes the downloaded information to the status indicator 65.

It is thus believed that the operation and construction of the present invention will be apparent from the foregoing description. While the indicator and system shown and described has been characterized as being preferred, it will be readily apparent that various changes and modifications could be made therein without departing from the scope of the invention as defined in the following claims.

WHAT IS CLAIMED IS:

1. A vehicle status device (12) for reporting status information for a vehicle to an interrogating unit (11), said device comprising:

a database (18) of status information for the vehicle;

an update receiver (15) that receives updated vehicle information for storage in the database;

an interrogation receiver (22) that receives an interrogation signal from the interrogating unit; and

a response transmitter (25) for transmitting the vehicle status information to the interrogating unit in response to the interrogation receiver receiving the interrogation signal.

2. The vehicle status device of claim 1 wherein the vehicle status information also includes status information for the owner of the vehicle.

3. The vehicle status device of claim 1 wherein the update receiver is a wide area pager receiver, and the updated vehicle information is received from a wide area paging network (13).

4. The vehicle status device of claim 1 wherein the interrogation receiver is a radar receiver that detects radar signals from police radar transmitters (21).

5. The vehicle status device of claim 1 wherein the interrogation receiver is a laser detector that detects laser signals from police laser transmitters (21).

6. The vehicle status device of claim 1 further comprising a processor (16) having a coder/decoder (17) that encodes the vehicle status information and sends it to the

response transmitter in response to the interrogation receiver receiving the interrogation signal.

7. A vehicle status device (12) for displaying status information for a vehicle, said device comprising:

a database (18) of status information for the vehicle;

an update receiver (15) that receives updated vehicle information for storage in the database;

an interrogation receiver (22) that receives an interrogation signal from an interrogating unit;

a vehicle status indicator (65) for indicating the vehicle status information; and

a processor (16) that retrieves the vehicle status information from the database and sends the information to the indicator in response to the interrogation receiver receiving the interrogation signal.

8. The vehicle status device of claim 7 wherein the vehicle status indicator includes a plurality of summary status indicators (67-70) that provide a summary of the vehicle status in predetermined areas of interest at a glance.

9. An electronic vehicle status device (12) for displaying status information for a vehicle, said device comprising:

a wireless Internet access device (71) that requests and receives updated vehicle information from at least one external database (43-46) that is accessible through the Internet (72);

a vehicle status indicator (65) for indicating the vehicle status information; and

a processor (16) that receives the vehicle status information from the wireless Internet access device and sends the information to the indicator.

10. The electronic vehicle status device of claim 9 further comprising:

an interrogation receiver (22) that receives an interrogation signal from an interrogating unit (64) and passes the signal to the processor; and

means within the processor for instructing the wireless Internet access device to access the external database and download the vehicle status information in response to receiving the interrogation signal.

11. A transponder for use in a vehicle having an assigned Internet Protocol (IP) address, said transponder comprising:

an interrogation receiver (22) that receives an interrogation signal from an interrogating unit (11); and

a response transmitter (25) that transmits the assigned IP address to the interrogating unit.

12. A system for remotely monitoring the status of a vehicle having an assigned Internet Protocol (IP) address, said system comprising:

a vehicle transponder (12) comprising:

an interrogation receiver (22) that receives an interrogation signal from an interrogating unit (11); and

a response transmitter (25) that transmits the assigned IP address to the interrogating unit; and

an interrogating unit (11) comprising:

an interrogation transmitter (21) that transmits the interrogation signal to the vehicle transponder;

a response receiver (26) that receives the assigned IP address from the vehicle; and

a wireless Internet access device (76) that requests and receives updated vehicle status information from at least one external database (43-46) that is accessible through the Internet (72).

13. A system for remotely monitoring the status of a vehicle having an assigned Internet Protocol (IP) address, said system comprising:

a vehicle status device (12) comprising:

an interrogation receiver (22) that receives an interrogation signal from an interrogating unit (11);

a response transmitter (25) that transmits the assigned IP address to the interrogating unit;

an internal database (18) of status information for the vehicle; and

a first wireless Internet access device (71) that requests and receives updated vehicle status information from at least one external database (43-46) that is accessible through the Internet, and passes the updated information to the internal database;

an interrogating unit (11) comprising:

an interrogation transmitter (21) for transmitting the interrogation signal to the vehicle transponder;

a response receiver (26) for receiving the assigned IP address from the vehicle; and

a second wireless Internet access device (76) that utilizes the vehicle IP address to retrieve the updated status information from the internal database in the vehicle status device through the Internet.

14. A system for remotely updating and locally displaying the status of a vehicle comprising:

a vehicle status device (12) for locally displaying status information for the vehicle when an interrogation signal (23) is received, said device comprising:

a database (18) of status information for the vehicle;

an update receiver (15) that receives updated vehicle information for storage in the database;

an interrogation receiver (22) that receives the interrogation signal from an interrogating unit (64); and

a vehicle status indicator (65) for indicating the vehicle status information in response to the interrogation receiver receiving the interrogation signal; and

an interrogating unit (11) comprising an interrogation transmitter (21) for transmitting the interrogation signal to the vehicle status device.

15. A system for remotely updating and monitoring the status of a vehicle comprising:

a vehicle status device (12) for reporting status information for the vehicle to an interrogating unit (11), said device comprising:

a database (18) of status information for the vehicle;

an update receiver (15) that receives updated vehicle information for storage in the database;

an interrogation receiver (22) that receives an interrogation signal (23) from the interrogating unit; and

a response transmitter (25) for transmitting the vehicle status information to the interrogating unit in response to the interrogation receiver receiving the interrogation signal; and

an interrogating unit (11) comprising:

an interrogation transmitter (21) for transmitting the interrogation signal to the vehicle status device; and

a response receiver (26) for receiving the vehicle status information from the vehicle status device.

16. The system for remotely updating and monitoring the status of a vehicle of claim 15 wherein the vehicle status device also includes a device processor (16) having a coder/decoder (17) that encodes the vehicle status information and sends it to the response transmitter in

response to the interrogation receiver receiving the interrogation signal.

17. The system for remotely updating and monitoring the status of a vehicle of claim 16 wherein the interrogating unit includes an interrogating unit processor (27) having a decoder/translator (28) that decodes the vehicle status information received from the vehicle status device, and translates the information into plain language for presentation to an operator.

18. The system for remotely updating and monitoring the status of a vehicle of claim 17 wherein the interrogating unit processor also includes a discriminator (30) that discriminates between multiple responses and prioritizes the responses for presentation to the operator.

19. A system for remotely reporting a vehicle identification (VID) comprising:

a vehicle reporting device (12) located in a vehicle for reporting the VID when an interrogation signal (53) is received from an interrogating unit (51), said device comprising:

an interrogation receiver (22) that receives the interrogation signal from the interrogating unit; and

a response transmitter (25) for transmitting the VID to the interrogating unit in response to the interrogation receiver receiving the interrogation signal; and

an interrogating unit (51) comprising:

an interrogation transmitter (52) for transmitting the interrogation signal to the vehicle reporting device; and

a response receiver (55) for receiving the VID from the vehicle reporting device; and

a database of subscribers (58), the database matching the VID with a subscriber, and providing an indication of whether the subscriber is currently a valid subscriber.

20. The system for remotely reporting a VID of claim 18 wherein the interrogating unit is located at a toll booth, and the subscriber database is remotely accessed by the toll booth over a data network (59).

21. The system for remotely reporting a VID of claim 20 further comprising a credit card authorization network (63), the authorization network being utilized to charge a toll charge to a credit card associated with the identified subscriber.

22. The system for remotely reporting a VID of claim 21 wherein the interrogation transmitter includes means for transmitting a radar signal utilized in police radar transmitters.

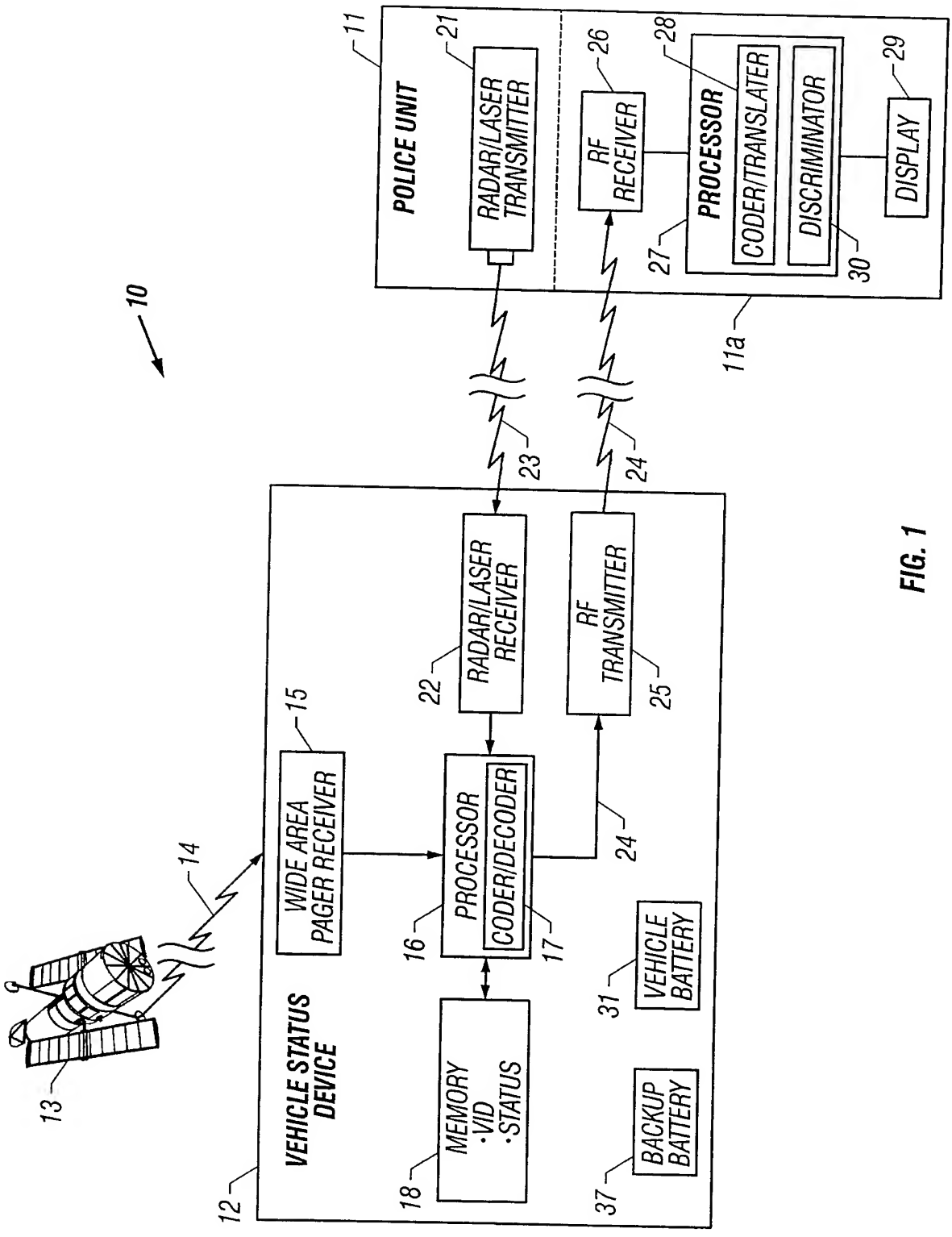
10
11
POLICE UNIT
21
RADAR/LASER TRANSMITTER
26
RF RECEIVER
28
PROCESSOR
CODER/TRANSLATER
DISCRIMINATOR
29
DISPLAY
27
30
11a
23
24
VEHICLE STATUS DEVICE
12
22
RADAR/LASER RECEIVER
RF TRANSMITTER
25
15
WIDE AREA PAGER RECEIVER
14
16
PROCESSOR
CODER/DECODER
17
24
13
18
MEMORY
·VID
·STATUS
31
VEHICLE BATTERY
37
BACKUP BATTERY

FIG. 1

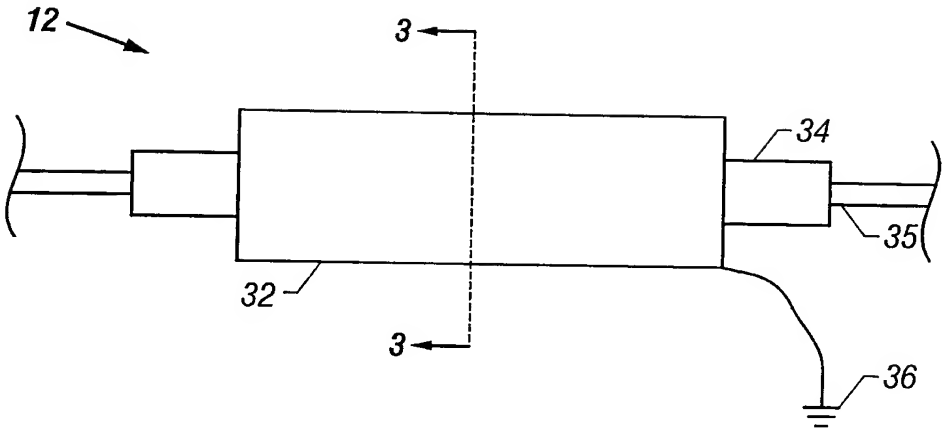

FIG. 2

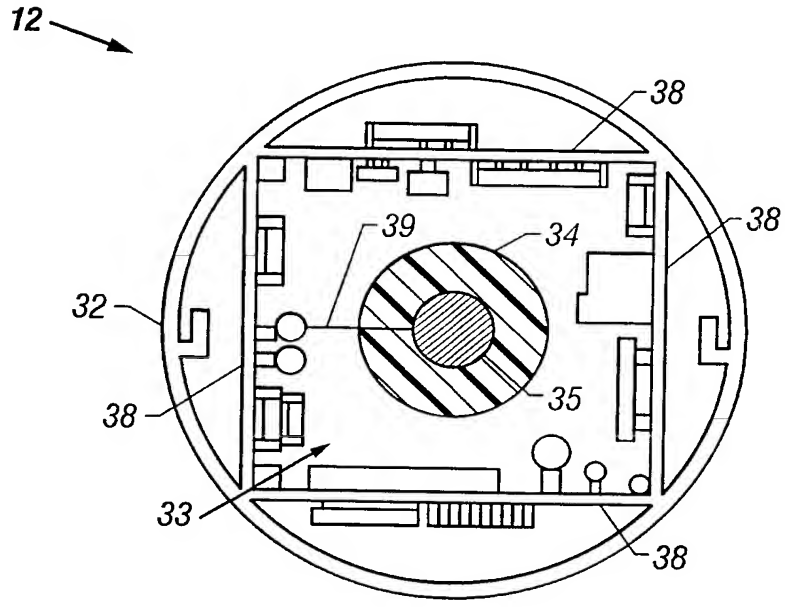

FIG. 3

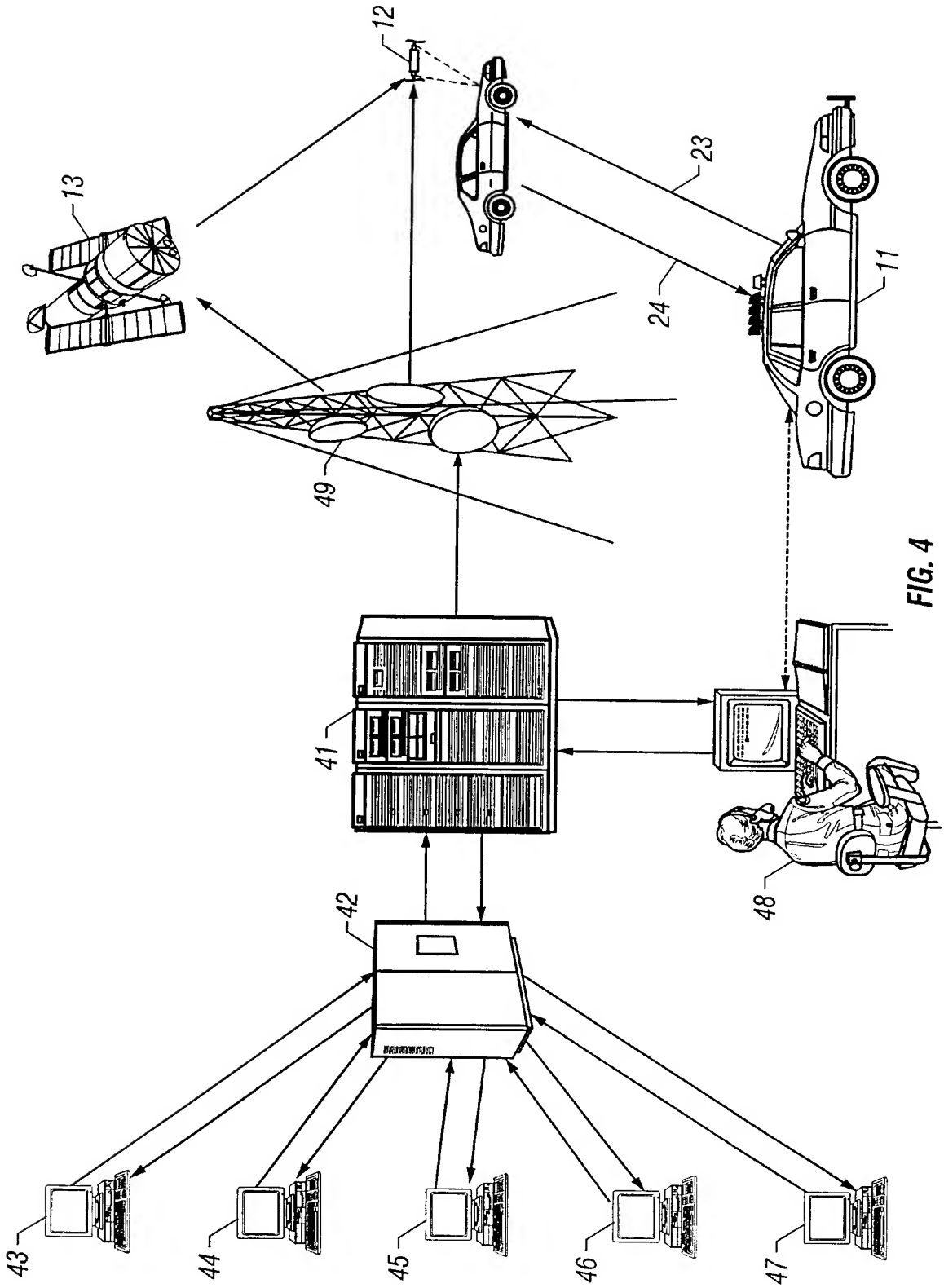

FIG. 4

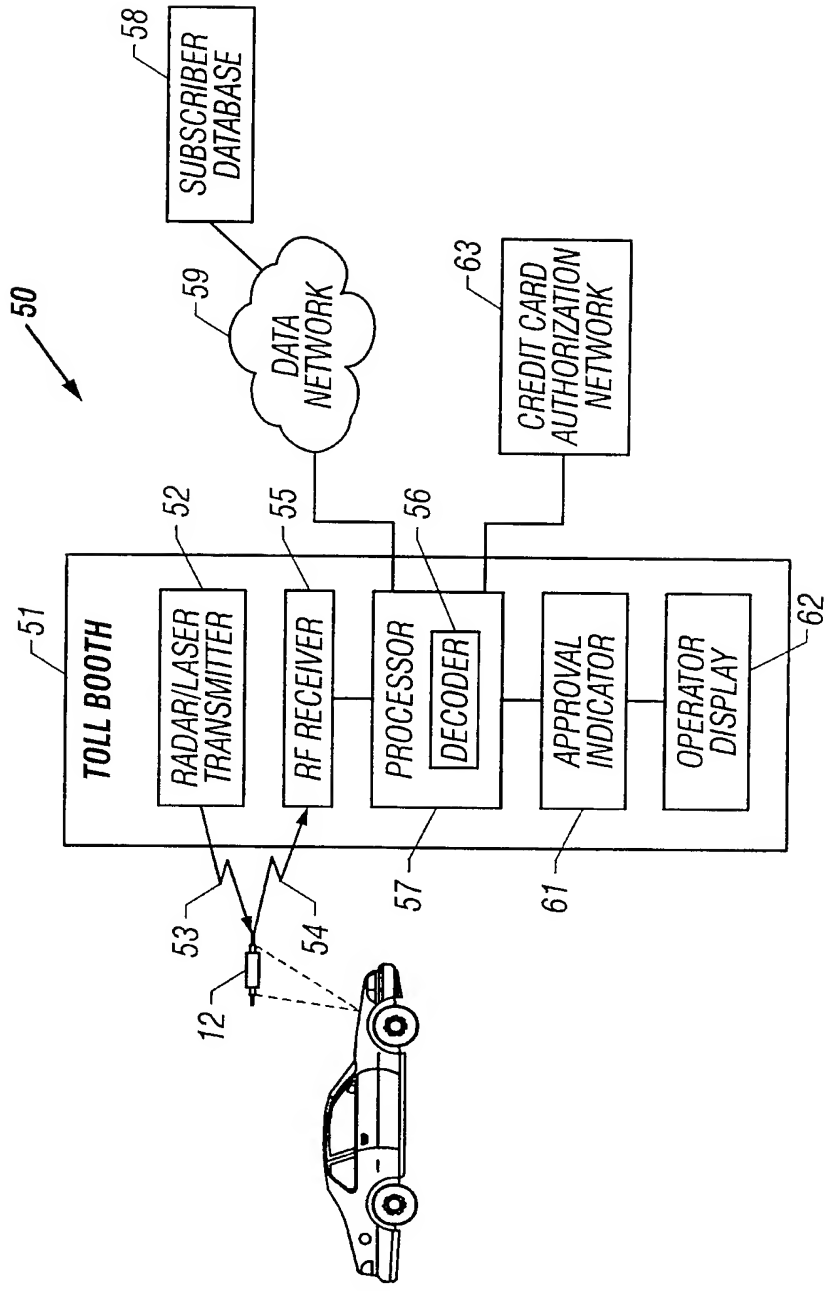
50
58
SUBSCRIBER DATABASE
59
DATA NETWORK
63
CREDIT CARD AUTHORIZATION NETWORK
52
55
56
51
TOLL BOOTH
RADAR/LASER TRANSMITTER
RF RECEIVER
PROCESSOR
DECODER
APPROVAL INDICATOR
OPERATOR DISPLAY
62
53
54
57
61
12

FIG. 5

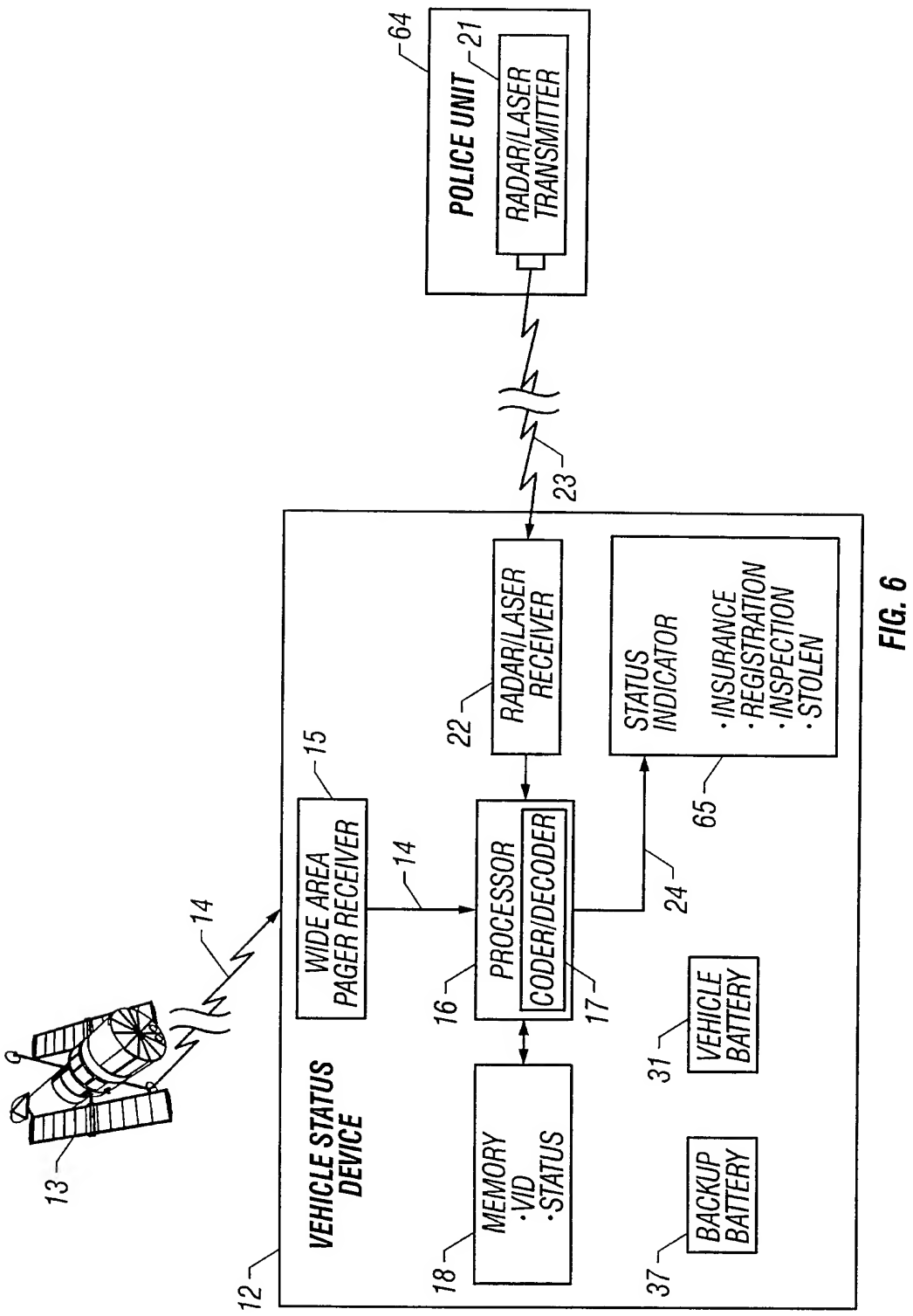
64
POLICE UNIT
21
RADAR/LASER TRANSMITTER
23
VEHICLE STATUS DEVICE
12
22
RADAR/LASER RECEIVER
STATUS INDICATOR
·INSURANCE
·REGISTRATION
·INSPECTION
·STOLEN
65
15
WIDE AREA PAGER RECEIVER
14
PROCESSOR
CODER/DECODER
16
17
24
14
13
18
MEMORY
·VID
·STATUS
31
VEHICLE BATTERY
37
BACKUP BATTERY

FIG. 6

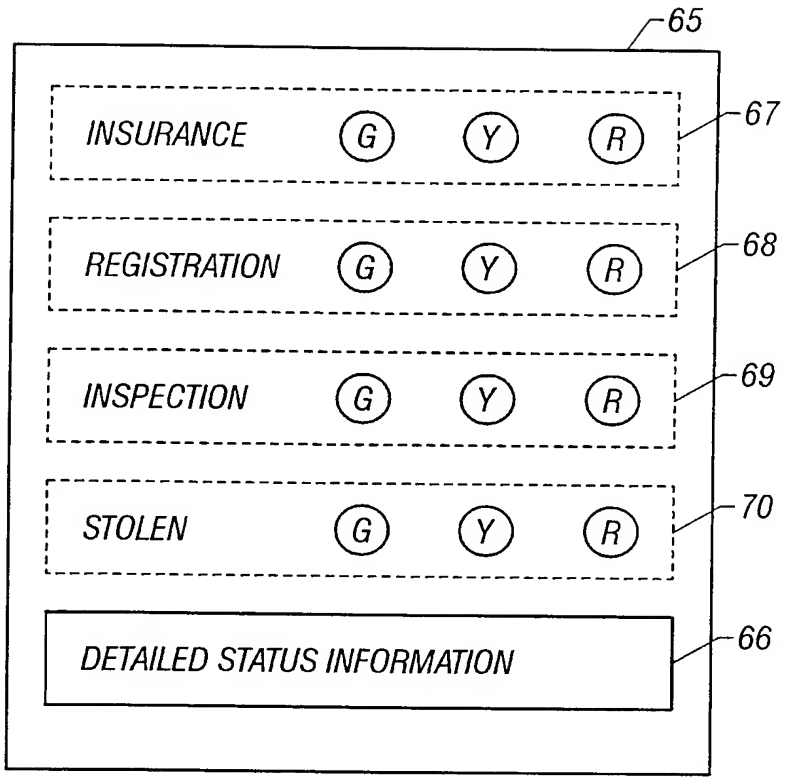
65
INSURANCE
G
Y
R
67
REGISTRATION
G
Y
R
68
INSPECTION
G
Y
R
69
STOLEN
G
Y
R
70
DETAILED STATUS INFORMATION
66

FIG. 7

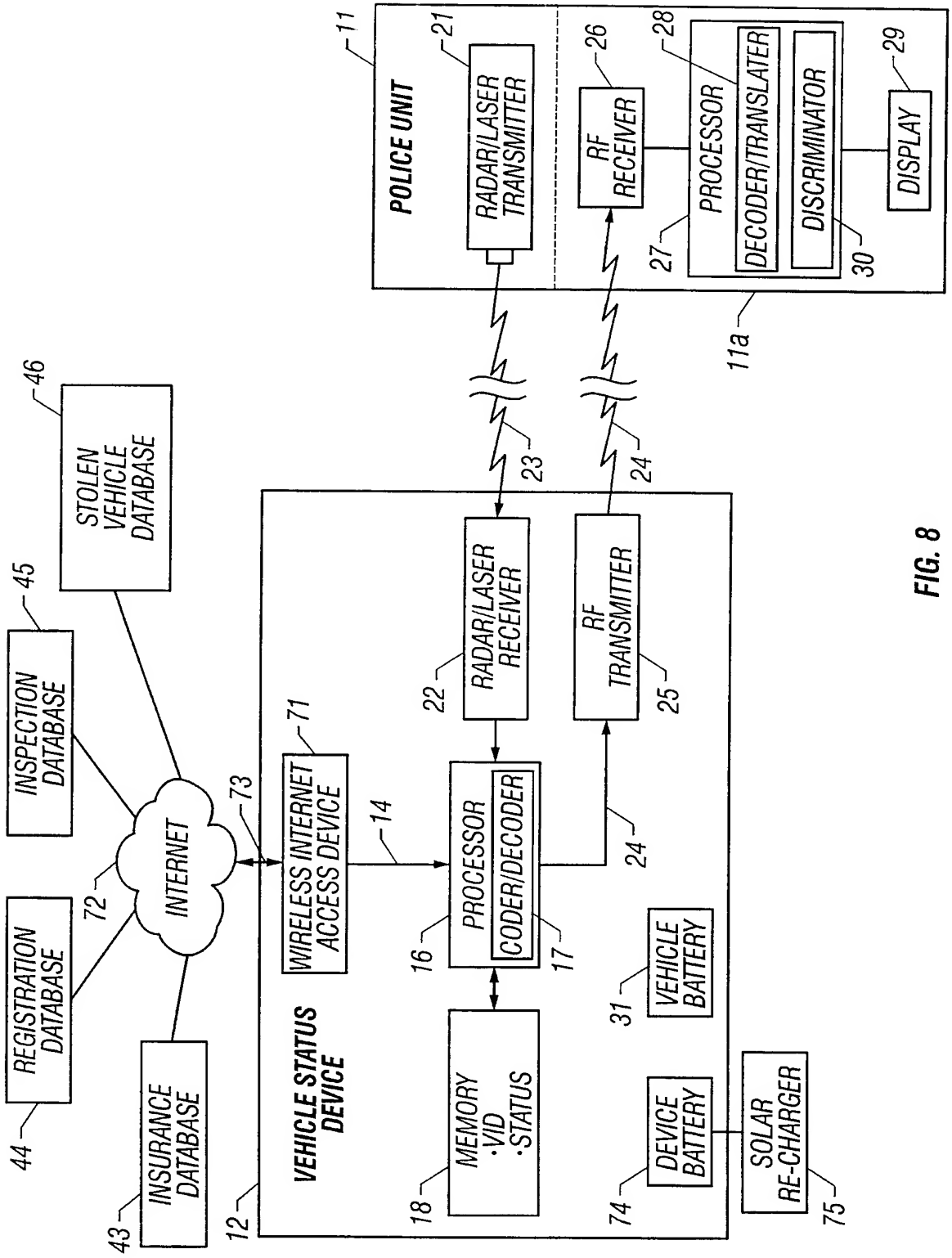
POLICE UNIT
11
RADAR/LASER TRANSMITTER
21
RF RECEIVER
26
PROCESSOR
28
DECODER/TRANSLATER
DISCRIMINATOR
27
30
DISPLAY
29
11a
23
24
STOLEN VEHICLE DATABASE
46
INSPECTION DATABASE
45
REGISTRATION DATABASE
44
INSURANCE DATABASE
43
INTERNET
72
73
WIRELESS INTERNET ACCESS DEVICE
71
14
VEHICLE STATUS DEVICE
12
RADAR/LASER RECEIVER
22
RF TRANSMITTER
25
PROCESSOR
CODER/DECODER
16
17
24
MEMORY
·VID
·STATUS
18
VEHICLE BATTERY
31
DEVICE BATTERY
74
SOLAR RE-CHARGER
75

FIG. 8

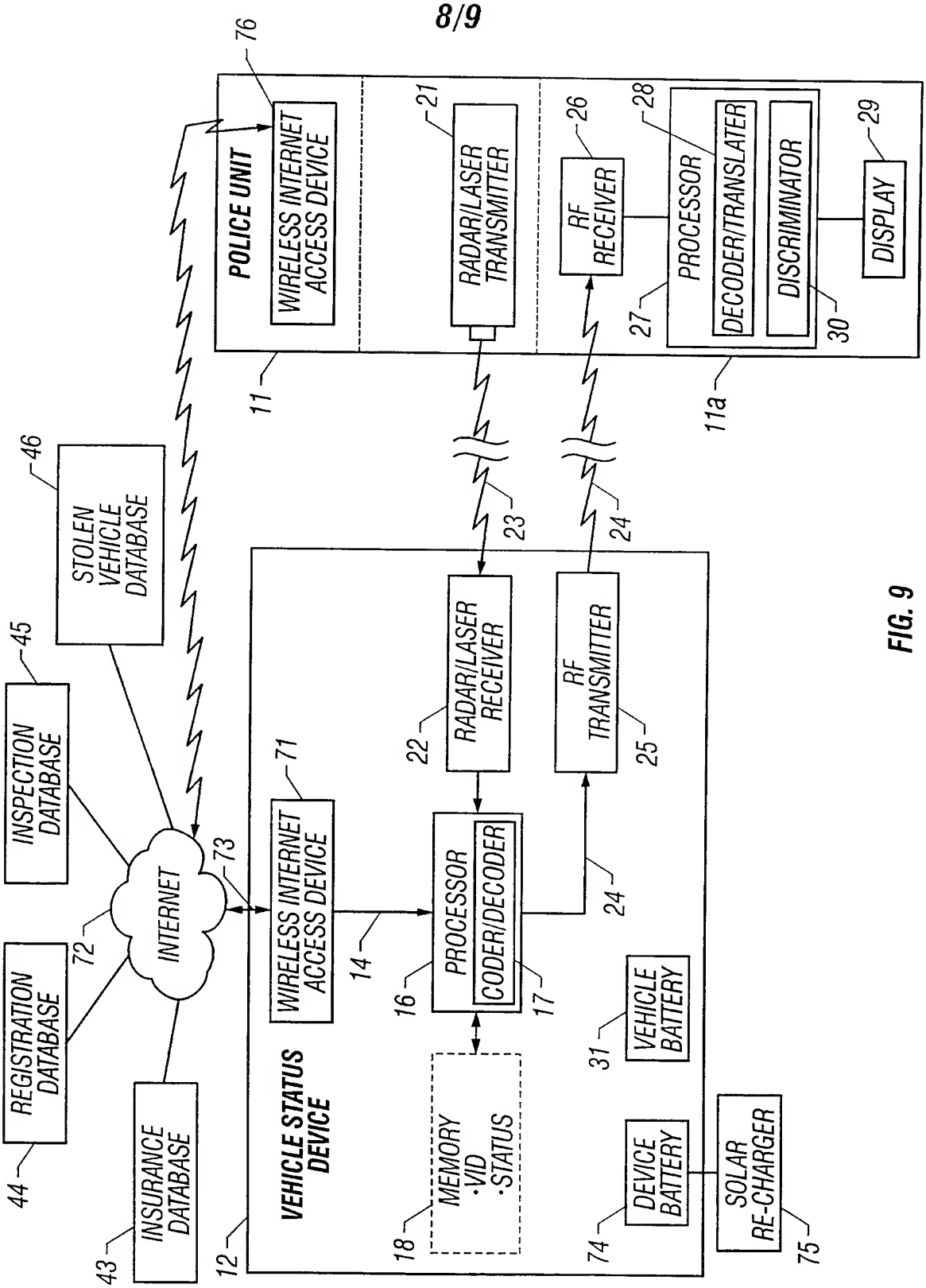
POLICE UNIT
WIRELESS INTERNET ACCESS DEVICE
RADAR/LASER TRANSMITTER
RF RECEIVER
PROCESSOR
DECODER/TRANSLATER
DISCRIMINATOR
DISPLAY
STOLEN VEHICLE DATABASE
INSPECTION DATABASE
REGISTRATION DATABASE
INSURANCE DATABASE
INTERNET
VEHICLE STATUS DEVICE
WIRELESS INTERNET ACCESS DEVICE
RADAR/LASER RECEIVER
RF TRANSMITTER
PROCESSOR
CODER/DECODER
MEMORY
·VID
·STATUS
VEHICLE BATTERY
DEVICE BATTERY
SOLAR RE-CHARGER
11
11a
12
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FIG. 9

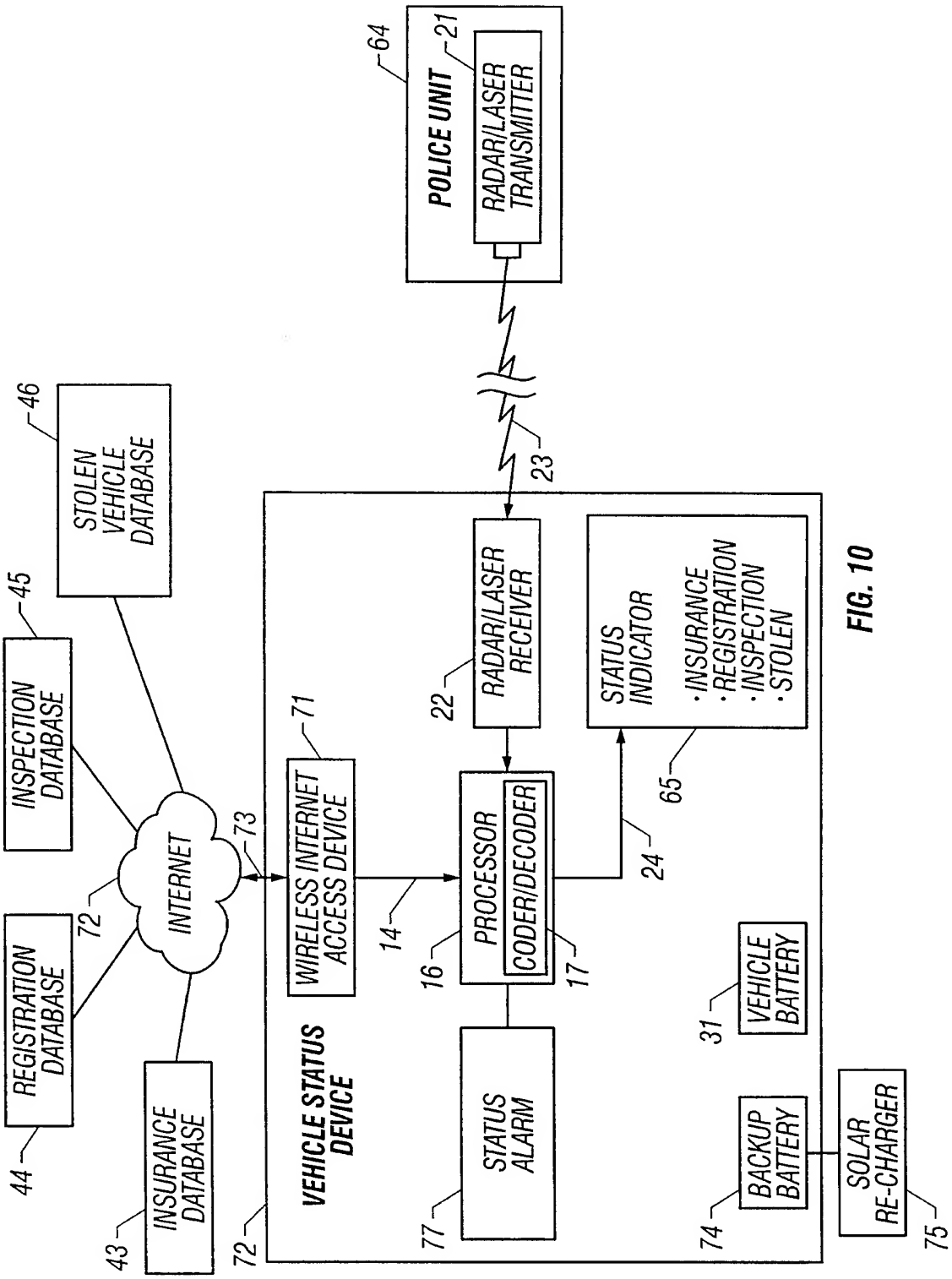
POLICE UNIT
64
RADAR/LASER TRANSMITTER
21
23
STOLEN VEHICLE DATABASE
46
INSPECTION DATABASE
45
REGISTRATION DATABASE
44
INSURANCE DATABASE
43
INTERNET
72
73
VEHICLE STATUS DEVICE
72
WIRELESS INTERNET ACCESS DEVICE
71
14
PROCESSOR
16
CODER/DECODER
17
RADAR/LASER RECEIVER
22
STATUS INDICATOR
·INSURANCE
·REGISTRATION
·INSPECTION
·STOLEN
65
24
STATUS ALARM
77
VEHICLE BATTERY
31
BACKUP BATTERY
74
SOLAR RE-CHARGER
75

FIG. 10

INTERNATIONAL SEARCH REPORT

Int. tional Application No
PCT/US 00/34846

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G08G1/017

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 G08G B60R B60Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 917 405 A (JOAO RAYMOND ANTHONY) 29 June 1999 (1999-06-29) column 10, line 9-29 column 19, line 18-31 column 28, line 44 -column 29, line 35	1-3,6, 9-11,13, 15-18
Y	figures 5B,11B	4,5,7, 12,14,22

Y	US 5 500 638 A (GEORGE IKOMA A V) 19 March 1996 (1996-03-19)	7,14
A	figure 2	8

X	WO 98 43104 A (PRICE FREDERICK J R W) 1 October 1998 (1998-10-01) page 2, line 23 -page 3, line 2 page 5, line 13-22 page 6, line 30 -page 7, line 15	19-21

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 March 2001	02/04/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Flores Jiménez, A

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INTERNATIONAL SEARCH REPORT

Int ational Application No
PCT/US 00/34846

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5 926 086 A (ARGOMANIZ MANNY ET AL) 20 July 1999 (1999-07-20) column 3, line 58-65 column 4, line 56-63	4,5,22
Y	WO 99 22353 A (MCCONNELL PETER R H ;SONIC SYSTEMS (CA); SCRAGG ROBERT A (CA)) 6 May 1999 (1999-05-06) page 9, line 10-22	12
A	page 17, line 2-13	9-14
P,X	US 5 963 129 A (WARNER KEVIN) 5 October 1999 (1999-10-05) column 4, line 56 -column 5, line 58	1,7,15, 19

1

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int. tional Application No
PCT/US 00/34846

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US 5963129 A	05-10-1999	NONE	